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NORTH ATLANTIC TREATY ORGANIZATION
ORGANISATION DU TRAITE DE L'ATLANTIQUE NORD

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12 January 1999 MAS/52-C3/4206

STANAG 4206 C3 (EDITION 3) - THE NATO MULTI-CHANNEL TACTICAL DIGITAL GATEWAY - SYSTEM STANDARDS

References:
a. AC/322-N/22 dated 24 September 1996 (Edition 3) (1st Draft)
b. MAS/409-EL/4206 dated 15 November 1993 (Edition 2)

1. The enclosed NATO Standardization Agreement which has been ratified by nations as reflected in page iii is promulgated herewith.

2. References listed above are to be destroyed in accordance with local document destruction procedures.

3. AAP-4 should be amended to reflect the latest status of the STANAG.

ACTION BY NATIONAL STAFFS

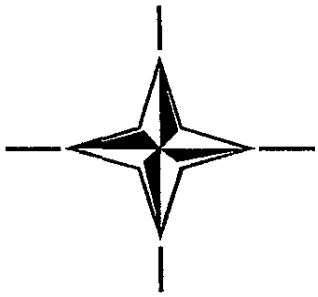
4. National staffs are requested to examine page iii of the STANAG and, if they have not already done so, advise the NHQC3S Division of their intention regarding its ratification and implementation.

K. GRØNHEIM
Major General, NOAF
Chairman MAS

Enclosure:
STANAG 4206 (Edition 3)

STANAG No. 4206
(Edition 3)

NORTH ATLANTIC TREATY ORGANIZATION
(NATO)



MILITARY AGENCY FOR STANDARDIZATION
(MAS)

STANDARDIZATION AGREEMENT

(STANAG)

SUBJECT: THE NATO MULTI-CHANNEL TACTICAL DIGITAL GATEWAY - SYSTEM STANDARDS

Promulgated on 12 January 1999

K. GRØNHEIM
Major General, NOAF
Chairman, MAS

RECORD OF AMENDMENTS

No.	Reference/date of amendment	Date entered	Signature

EXPLANATORY NOTES

AGREEMENT

1. This NATO Standardization Agreement (STANAG) is promulgated by the Chairman MAS under the authority vested in him by the NATO Military Committee.

2. No departure may be made from the agreement without consultation with the tasking authority. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.

3. Ratifying nations have agreed that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purposes of identification.

DEFINITIONS

4. Ratification is "In NATO Standardization, the fulfilment by which a member nation formally accepts, with or without reservation, the content of a Standardization Agreement" (AAP-6).

5. Implementation is "In NATO Standardization, the fulfilment by a member nation of its obligations as specified in a Standardization Agreement" (AAP-6).

6. Reservation is "In NATO Standardization, the stated qualification by a member nation that describes the part of a Standardization Agreement that it will not implement or will implement only with limitations" (AAP-6).

RATIFICATION, IMPLEMENTATION AND RESERVATIONS

7. Page iii gives the details of ratification and implementation of this agreement. If no details are shown it signifies that the nation has not yet notified the tasking authority of its intentions. Page iv (and subsequent) gives details of reservations and proprietary rights that have been stated.

FEEDBACK

8. Any comments concerning this publication should be directed to NATO/MAS - Bvd Leopold III - 1110 Brussels - BE

ARMY/NAVY/AIR

NATO STANDARDIZATION AGREEMENT
(STANAG)

THE NATO MULTI-CHANNEL TACTICAL DIGITAL GATEWAY
- SYSTEM STANDARDS -

Annexes: A. General Characteristics
B. Technical Characteristics
C. Definitions
D. NPICS Proforma

Related Documents

MC 277/2	-	Operational Requirements for the Interoperability of Communications Systems Used by the Combat Forces of the NATO Nations in the Pre-2000 Period
STANAG 4214	-	International Routing and Directory for Tactical Communications Systems
STANAG 5046	-	The NATO Military Communications Directory System
STANAG 5048	-	The Minimum Scale of Communications for the NATO Land Forces - Requirements, Principles and Procedures
MCM-SYP-104-92	-	Tactical Communications Systems COMSEC Standards for Digital Gateways Specified in the STANAGs 4206-4214
ACP 122C	-	Communications Instructions Security

INTRODUCTION

1. This STANAG is one of a series which, when taken together, specifies all the technical characteristics, parameters, and procedures necessary for two NATO digital tactical communications systems (networks) to interconnect and exchange traffic via a gateway.

2. This STANAG describes overall system features of the gateway and defines the operational and technical aspects of such a gateway. The STANAGs of this series are:

STANAG 4206	-	The NATO Multi-Channel Tactical Digital Gateway - System Standards
STANAG 4207	-	The NATO Multi-Channel Tactical Digital Gateway - Multiplex Group Framing Standards
STANAG 4208	-	The NATO Multi-Channel Tactical Digital Gateway - Signalling Standards
STANAG 4209	-	The NATO Multi-Channel Tactical Digital Gateway - Standards for Analogue to Digital Conversion of Speech Signals
STANAG 4210	-	The NATO Multi-Channel Tactical Digital Gateway - Cable Link Standards
STANAG 4211	-	The NATO Multi-Channel Tactical Digital Gateway - System Control Standards
STANAG 4212	-	The NATO Multi-Channel Tactical Digital Gateway - Radio Relay Link Standards
STANAG 4213	-	The NATO Multi-Channel Tactical Digital Gateway - Data Transmission Standards
STANAG 4249	-	The NATO Multi-Channel Tactical Digital Gateway - Data Transmission Standards (Packet Switching Service)
STANAG 4290 (Draft)	-	The NATO Multi-Channel Tactical Digital Gateway - Cable Link (Optical) Standards

These STANAGs satisfy the gateway requirements of MC 277/2.

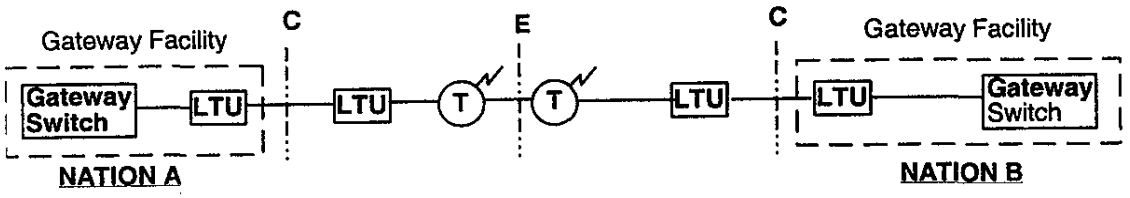
AIM

3. The aim of this agreement is to define the system standards for interoperation between trunk networks of different nations via a gateway.

4. The participating nations agree to use the characteristics in this STANAG as the system standards exchange traffic between tactical digital systems via a gateway.

GENERAL

5. The interconnection of two digital tactical area communications systems via a gateway will typically be as shown in Figure 1. Any actual gateway link may differ from this typical example in the amount of radio and/or cable sections.



KEY:

LTU	=	line terminating unit
T	=	radio relay terminal or satellite ground terminal
C	=	cable interconnection point
E	=	radio interconnection point (air interface for satellite is for future study)

FIGURE 1. Gateway Link With Possible Interconnection Points (C and E Indicated).

6. All gateway facilities shall provide a metallic cable interconnection point. The interconnection point on the gateway link may, by bilateral agreement, be either on cable (point C) or in the air (point E).

7. In the case of a metallic cable interconnection (point C), the implementation shall comply with STANAG 4210. In the case of fiber-optic cable interconnection (point C), the implementation shall comply with STANAG 4290. In the case of a radio interconnection (point E), the implementation shall comply with STANAG 4212 for radio relay terminals. The radio frequency interconnection point for satellite terminals is undefined.

8. The equipment on the lefthand side of the interconnection point (either C or E) belongs to, and shall be operated by, Nation A; the equipment on the righthand side of the interconnection point belongs to, and shall be operated by, Nation B.

9. The ultimate aim of this series of STANAGs is to ensure that the technical capability exists for any interconnection point to be in the air (point E). In that case, the interfacing of two communications networks can be performed without the need to send communications detachments. The operational acceptability of implementing this technical capability is outside the scope of this STANAG.

IMPLEMENTATION OF AGREEMENT

10. This STANAG is implemented by a nation when multi-channel tactical digital gateways (system standards) in that nation's forces comply with the characteristics detailed in this agreement and are placed in service.

GENERAL CHARACTERISTICS

GENERAL

1. Each gateway will be designed to provide fully automatic, full-duplex facilities to users so that two types of traffic can be passed across the NATO multi-channel digital gateway:

a. voice
b. non-voice

Note: Non-voice traffic may include telegraph, facsimile, and general computer data.

2. Where neighboring networks operate at different bit rates, the gateway link shall be established at a 16-kbit/s channel transmission rate. The onus of conversion shall lie with the non-16-kbit/s network.

CHARACTERISTICS OF VOICE TRAFFIC

3. In order to permit the transmission of digitized voice in the available traffic channels of the gateway, interoperable voice encoding/decoding systems will be employed. These will be based on delta modulation with digital companding, using 3-bit logic. The implementation shall comply with STANAG 4209.
Nations that do not use CVSD-encoded signals in their tactical systems shall deliver CVSD-encoded signals, which comply with STANAG 4209, across gateway links.

CHARACTERISTICS OF NON-VOICE TRAFFIC

4. Non-voice traffic transmitted across the gateway shall not exceed a maximum information rate of 16 kbit/s (or 64 kbit/s if multi-timeslot operation is used) to permit the exchange of traffic without the loss of significant elements.

5. Two forms of services exist:

a. circuit-switched services
b. packet-switched services

The implementations of circuit-switched services and packet-switched services shall comply with STANAGs 4213 and 4249, respectively. The various connection types, bit rates, and class of calls associated with circuit-switched services are identified in STANAG 4208.

6. For circuit-switched services, the digital circuit established, on a per-call basis, shall be transparent during the traffic phase of a call. The circuit shall operate at a channel transmission rate of 16 or 32 kbit/s. At a transmission rate of 32 kbit/s, each bit shall be transmitted twice (simple repetition).

7. Warning: It is desirable that the data bit sequences on the circuit-switched channels do not imitate certain in-band signalling sequences, as specified in Table 2. Where the imitation of these in-band sequences cannot be prevented, it is recommended that data class 4, as specified in STANAG 4213, be used.

DIRECTORY ORGANIZATION

8. In all digital networks using a gateway, the full subscriber identity shall be provided by a fixed-length sequence of 7-decimal digits. It is desirable, but not mandatory, that this 7-digit address be fixed and deducible, according to the appointment of the subscriber, in accordance with STANAG 5046. The 7-digit subscriber address may be identical or different for packet-switching and circuit-switching subscribers connected at the same physical interface.

9. When a call is between different nations' networks, the subscriber's 7-digit address will be prefixed by a 6-digit routing code (see STANAG 4214). The same routing code is used for both packet-switching and circuit-switching addresses in any particular formation. This routing code will be passed over the gateway together with the 7-digit subscriber's address as parts of a formatted message. The routing of both circuit-switching and packet-switching calls to a gateway is a national matter and outside the scope of this STANAG. It should however be noted that prefixes stored at the gateways for routing between networks may be different for circuit-switching and packet-switching.

10. Subject to 8 and 9, above, the structure of the subscriber's address will be a national concern. It is necessary, however, that provision be made as part of the gateway organization to provide the directory address information to all with a need to know.

CALL PRECEDENCE

11. The precedence status of any call offered to a gateway from a network will be included in the signalling sequences. The signalling messages will identify up to five levels of precedence, in accordance with STANAG 4208. Transit and terminating networks will process the call in accordance with their internal precedence rules. In the case of transit calls, the original precedence levels shall be restored and forwarded to the following network.

END-TO-END TRANSMISSION PERFORMANCE

12. The overall objective for transmission performance on any circuit-switched connection via the gateway is to achieve an error rate not in excess of 1 in 100 for 95% of any 1-minute period. This pertains only to circuits which operate with an information rate of 16 kbit/s or 32 kbit/s end-to-end, and excludes errors due to man-made interference.

IN-CHANNEL SIGNALLING

13. Signals which are liable to be transmitted over the gateway during a call are specified in Table 1. All idle traffic channels of the Gateway Multiplex Group shall carry the all-ONES code.

14. Signals which may cause disruption in the receiving network during a call are specified in Table 2.

15. The characteristics and detection criteria for these signals are as specified in Table 3.

INTERNATIONAL CONFERENCES

16. A conference is a circuit composed of more than two subscribers, with one speaker and several listeners. From time to time any subscriber can become the speaker.

17. It is an agreed requirement that, once the conference call is established, the port on the conference combiner, to which each subscriber is connected, should be enabled only when the subscriber indicates he wishes to talk (e.g., by pressing the 'pressel switch' on his handset). This is to prevent unwanted background noise from interfering with the conference.

18. The implementation of this requirement differs, depending on whether the conference bridge works on analogue or digital principles.

19. It is the ultimate aim that all conference bridges work on digital principles and that the port connected to a channel on the gateway be controlled by the following in-channel, 8-bit, cyclically permutable codewords (CPC), which shall always be transmitted at 16 kbit/s and for 20 to 50 ms:

a. Enable port ('pressel on') 11001000
b. Disable port ('pressel off') 11000100

20. In the interim period, while not all subsets (or networks) generate pressel signals, it shall be possible to permanently enable at least one port on the conference bridge connected across the gateway in such a way that pressel signals are unnecessary.

Warning: In general as an increasing number of ports in a conference bridge are permanently enabled, the background noise may increase to unacceptable levels.

21. Conference calls shall follow the same precedence rules as normal calls.

22. The originating network shall provide the conference bridge function. A conference connection request, for each subscriber, shall be forwarded across gateways to other networks, as specified in STANAG 4208.

Table 1. CPC Signals Liable to be Transmitted Over the Gateway During a Call.

SYSTEM	SIGNAL NAME	CODE	BINARY	NOTES
EUROCOM	Ones	8a	11111111	
	-	7a	11111110	1, 2
	Repeat	6a	11111100	1
	Release	6b	11111010	
	CMR	6c	11110110	
	SA	6c	11110110	1
	Recall	6d	11101110	
	Ring	5b	11110100	1
	Pre-emption	5c	11110010	
	CCN (16)	5e	11101010	1, 3
	Mode 1, Digit 1	4a	11110000	1
	Mode 2, Digit 2	4b	11101000	1
	Mode 3, Digit 3	4c	11100100	1
	Mode 4, Digit 4	4d	11100010	1
	Mode 5, Digit 5	4e	11011000	1
	Mode 6, Digit 6	4f	11010100	1
	Mode 7, Digit 7	4g	11010010	1
	Busy, Digit 8	4h	11001100	1, 2
	Digit 9	4i	11001010	4
	Idle	4j	10101010	
	Send mode	3a	11100000	1
	Pressel on	3c	11001000	
	Pressel off	3d	11000100	
	Test	3e	11000010	1, 2
	CCN (32)	3f	10101000	4
	TE	2a	11000000	
	Mode 0, Digit 0	2a	11000000	1
	Seize	2b	10100000	
	CCA	2c	10010000	1
	TEA	2d	10001000	
	Mode accepted	2d	10001000	1
	Zeros	0a	00000000	
TRI-TAC/MSE	Call Answer/Lock-In	0a	00000000	
	Idle	4j	10101010	
	C-Key	2d	10001000	
	Release/Pre-empt	6b	11111010	
	Seize	6c	11110110	
RITA	None		None	
NICS	(to be specified)			

NOTES:
1. Sent end-to-end during change mode or sole-user sequences only.
2. Norwegian implementation.
3. Netherlands' implementation.
4. United Kingdom implementation.

Table 2. CPC Signals Which Might be Reacted Upon When Received Over the Gateway During a Call.

SYSTEM	SIGNAL NAME	CODE	BINARY	NOTES
EUROCOM	Release	6b	11111010	1
	CMR	6c	11110110	1
	Dial	5a	11111000	3
	Pending call release	5b	11110100	
	Pre-emption	5c	11110010	
	Standby	5d	11101100	2, 3
	EOH	5f	11100110	
	Pressel on	3c	11001000	
	Pressel off	3d	11000100	
	Seize	2b	10100000	1
	Pending call	1a	10000000	
TRI-TAC/MSE	Cue	6a	11111100	
	Release	6b	11111010	
	Seize	6c	11110110	
RITA	None		None	
NICS	(to be specified)			

NOTES:

1. Sent end-to-end during change mode or sole user sequences only.
2. Norwegian implementation.
3. Netherlands' implementation.

Table 3. In-Channel Signalling Characteristics and Detection.

EUROCOM:		
Characteristics	-	Uses all 36 possible 8-bit cyclically permutable codewords (CPCs).
Detection	-	1. In an error-free environment, detection of a codeword shall take place within the reception period of 48 consecutive bits (6 receptions of the codeword). 2. In an environment with up to 1% bit error rate, detection of a codeword shall be ensured, with a probability of 99.99% within the reception period of 320 consecutive bits to obtain 6 contiguous error-free codewords. 3. With a random bit stream, false detection of a codeword shall not occur more thar once in 7.7 x 10E10 bits, with a probability of 99.99%. 4. Signalling is always at 16 kbit/s; i.e., at the 32-kbit/s channel transmission rate, each bit is sent twice.
TRI-TAC/MSE:		
Characteristics	-	Uses only the 20 even-parity 8-bit cyclically permutable codewords.
Detection	-	Examples of detection criteria are 9 out of 16 majority vote for supervisory signals, and 5 consecutive error-free codewords for address signals.
RITA:	-	No in-channel signalling will be processed or systematically transmitted. Transparency for transit CPC signalling cannot be guaranteed.
NICS:	-	(To be specified).

ANNEX A to
STANAG 4206
(3rd Edition)

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TECHNICAL CHARACTERISTICS

GENERAL

1. The gateway will comprise a full-duplex transmission link ['gateway link (GL)'] and the terminating facilities ['Gateway Facilities (GF)'] at each end of the link. Each GF comprises transmit and receive terminal equipment.

GATEWAY LINK

2. The GL is defined as the transmission elements of the gateway and may include cable, radio relay sections, or a satellite section. The link terminates at the GF.

GATEWAY FACILITIES

3. The GF would typically comprise the equipment which handles the 256 kbit/s, or the optional 512 kbit/s multiplex group signals containing framing, signalling, and traffic channels, and the 16-kbit/s EOW at each end of a GL. The GF would typically contain the following functions:

a. multiplex group synchronization
b. speed buffering (does not include buffering for satellites)
c. gateway signal processing
d. traffic channel switching and multiplexing
e. bulk encryption*
f. line termination
g. EOW

* NOTE: In the interim period, nations not having NATO-approved encryption equipment (MCM-SYP-104-92) are permitted to use Approved Cable Links, which shall be in accordance with ACP 122C, by prior arrangement between the nations concerned.

4. The processors at each GF shall be able to communicate via formatted messages sent on the common signalling channel of the gateway multiplex group.

5. The provision of the GF is a national concern. There is no requirement for a common NATO equipment or installation, provided that the functions are achieved.

CHARACTERISTICS OF THE GATEWAY MULTIPLEX GROUP

6. The digital gateway multiplex group is organized as a synchronous time-division multiplexed (TDM) frame of 16 timeslots. It operates in a full-duplex mode at a bit rate of 256 kbit/s, but where capability exists the group may operate at 512 kbit/s (by bilateral agreement). Based on one timeslot per channel, all channels will operate at the same channel transmission rate, either 16 kbit/s for the 256 kbit/s group rate or optionally 32 kbit/s for the 512 kbit/s group rate.

7. The digital gateway multiplex group framing implementation shall comply with STANAG 4207.

TIMING AND JITTER

8. The bit rate of 256 or 512 kbit/s over the gateway shall have timing derived from a high stability clock for each direction of transmission. The clock accuracy shall be better than 1 part in 10^9. By bilateral agreement, one nation at a gateway may obtain this timing by slaving to the incoming bit stream.

9. The general objective for bit count integrity (BCI) on any circuit-switched connection via the gateway is to maintain end-to-end BCI for the duration of a call. When performed on a group basis, BCI over the gateway shall be maintained over a
24-hour (86,400 sec) period using, for instance, a resettable buffer store at each receiving GF. It shall be possible to reset the buffer store at any time. The TDM group shall resynchronize after a buffer store reset.

10. BCI shall be maintained over the gateway during fading periods up to 20 ms.

11. The jitter present on the bit stream transmitted to the interconnecting medium used at the interconnecting point shall not exceed the values represented by Figures 2 and 3. Each nation shall be able to tolerate at least this jitter from the nearest transmitting equipment of the other nation.

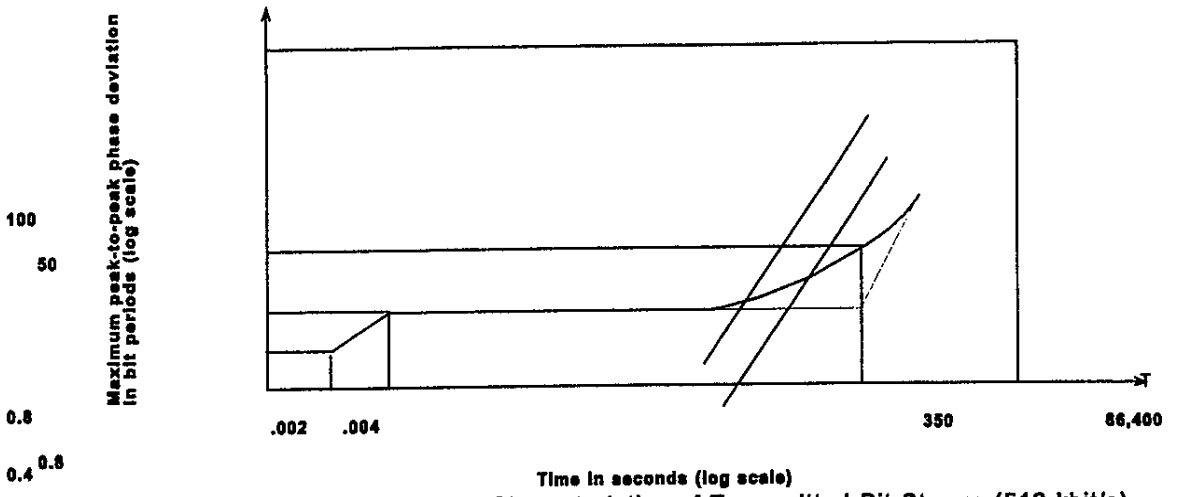

Figure 2. Phase Deviation Characteristics of Transmitted Bit Stream (512 kbit/s).

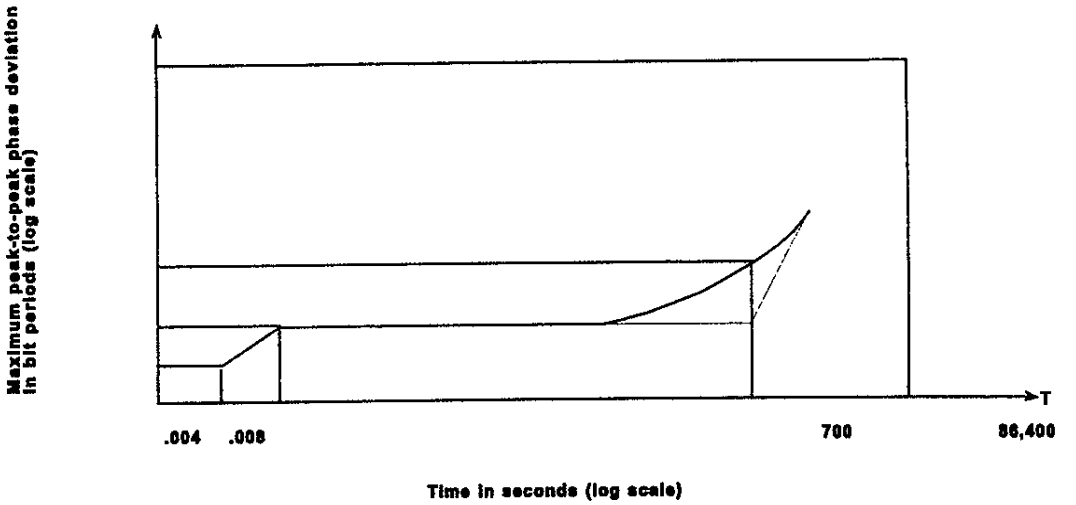

Figure 3. Phase Deviation Characteristics of Transmitted Bit Stream (256 kbit/s)

NOTE:Peak-to-peak phase deviation during a sampling interval T is the absolute value of the maximum difference between the instantaneous phases measured at any two instants within the sampling interval. The maximum number of bits displaced in a 24 hour period allows for three factors:

a. jitter
b. clock drift
c. transmission media delay variations

NOTE: Jitter may accumulate in the link between the transmitting gateway facility and the interconnection point. For the purposes of this specification Figures 2 and 3 relate to the interconnection point and not to the gateway
facility. When specifying national equipment to link the two sites the jitter analysis should consider up to five sections in the link, between the gateway facility and the interconnection point.

ERROR RATE BETWEEN GFs

12. The error rate between the GFs shall not exceed 4 in 10^4 for 99% of any 1-minute period. For design purposes, the GL may be taken to include up to 2 cable sections and 3 radio relay sections, and/or 1 satellite section.

METALLIC CABLE INTERFACE

13. If the interconnection point of the GL is at a metallic cable section, then the following standards will apply:

a. The cable will be a field-deployable type containing two balanced pairs in spiral quad form, one pair for each direction of transmission.

b. The line code for transmission of the 256- or 512-kbit/s binary signal will be conditioned diphase.

c. Provision shall be made for a 16-kbit/s EOW circuit via the cable phantom.

d. The bit error rate (traffic) on a single cable section (2 km) shall not exceed 1 in 10^6 for 99% of any 1-minute period.

Detailed parameters of the metallic cable section shall be as given in STANAG 4210.

FIBER-OPTIC CABLE INTERFACE

14. For fiber-optic cable sections, which have negligible influence on error performance, the detailed parameters, including the 16-kbit/s EOW, shall be as specified in
STANAG 4290.

RADIO RELAY INTERFACE

15. If the interconnection point of the GL is at a radio relay section, then the following standards will apply:

a. The radio transmission will be binary FM at bit rates of 256 or 512 kbit/s.

b. The radio relay section will provide for a 16-kbit/s EOW circuit, employing additive binary modulation, usable both in the presence or the absence of digital multiplex signals.

c. The bit error rate (traffic) on a single radio relay section shall not exceed 1 in 10^4 for 99% of any 1-minute period.

16. Detailed parameters of radio relay equipment implementation shall comply with STANAG 4212.

SATELLITE TRANSMISSION

17. The interconnection point of the GL at a satellite section is at present not defined; it will be defined as a long-term solution. In the interim period, when satellite links are involved, the international interconnection point will be between the satellite ground terminal of one nation and the GF of the other nation; hence, it will be either a cable or a radio relay interface. Buffering required to compensate for propagation delay variations will be provided by nations that provide the satellite ground terminals.

SIGNALLING BETWEEN GATEWAY FACILITIES

18. All necessary signals for call setup and clear-down will be passed over the gateway as common-channel signals, using formatted messages protected by a forward error detection (FED) and ARQ system to ensure a low error rate on the interprocessor data circuit. In the case of transmission links with long delays (such as satellite paths), the use of acknowledgment messages will be an alternative to FED/ARQ techniques. The message formats and transmission procedures shall comply with STANAG 4208.

COMSEC

19. All information passed over the gateway shall be protected by an approved NATO encryption device at the appropriate multiplex rate, i.e., 256 or 512 kbit/s, to provide

both traffic flow security (TFS) and traffic characteristic security (TCS). Details are given in MCM-SYP-104-92. By bilateral agreement, when the GL comprises a cable section, approved circuit techniques may be used instead of using encryption devices. Details are given in ACP 122C.

ENGINEERING ORDERWIRE (EOW)

20. Provision will be made for a 16-kbit/s digital EOW circuit between GFs, with access at designated intermediate manned stations on the gateway link.

21. The EOW system will be operated in the half-duplex mode with provision for encryption by an approved NATO equipment. Analogue-to-digital conversion of voice signals shall comply with STANAG 4209. The EOW system implementation shall comply with STANAG 4211.

GATEWAY CONTROL

22. When a gateway is to be established between any two national networks, certain advance planning is necessary. Also, control information and user data must be exchanged over the gateway when operational. Provision must be made for exchange of system control information, in accordance with STANAG 4211, prior to establishment of a gateway.

PACKET CHANNEL SET-UP PROCEDURES

23. When gateway links are used to support the transmission of packet-switched data between packet switches, the following procedures shall apply:

a. One timeslot, timeslot number 2, shall be assigned as a permanent connection between the packet switches.

b. Multi-timeslot operation requiring 2, 3, or 4 timeslots, to be assigned as permanent connections, may be used as optional modes if bilaterally agreed. For multi-timeslot operation, timeslots 2 and 3 shall be used to provide 32 kbit/s channels; timeslots 2, 3, and 4 shall be used to provide 48 kbit/s channels; and timeslots 2, 3, 4, and 5 shall be used to provide 64 kbit/s channels across gateway links.

c. Packet-switched data transmitted across the gateway link shall include Class 4 operation at 9.6 kbit/s, as defined in STANAG 4213. Class 1 operation or Class 4 operation at 2.4 kbit/s may be used, if bilaterally agreed.

d. The channel will be considered set up when each packet switch is sending and receiving flags, as defined in STANAG 4249.

e. Timeslots other than those provided in 23.a and 23.b may be used if bilaterally agreed.

f. Sole-user-type circuit-switched connections may be used in place of the permanent connections described in 23.a and 23.b if bilaterally agreed. In this case the timeslot assignment shall be provided in the Connection Request message, as defined in STANAG 4208.

ANNEX B to
STANAG 4206
(3rd Edition)

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DEFINITIONS

Channel

1. The term *channel* is used to describe part of the total transmission capacity of a system provided to users for a single connection. The channel capacity is expressed as bit rate for digital systems. For the NATO digital gateway link, channels are full-duplex connections between two gateway facilities. The information transmitted through the channels is carried by given timeslots in successive frames of the time-division multiplexed group. The same timeslot numbers are assigned to channels for each direction of transmission. For normal operation one timeslot (in each direction) is allocated to each channel. Multiple timeslots may be assigned to a channel to increase the channel bit rate. (See multi-timeslot.)

Dialed connection

2. A dialed connection is a circuit setup between a subscriber and one or more other subscribers. The circuit setup and release is initiated by the subscriber. To set up the connection, the subscriber action consists of going "off-hook" and dialing the directory number of the called party. To release the connection, the subscriber action is limited to going "on-hook." Dialed connections may be two party or multi-party calls where multi-party is conference or broadcast.

3. The subscriber terminals shall be provided with signalling facilities. A dialed connection request shall be forwarded across gateways to other networks, as specified in STANAG 4208.

Direct access

4. A direct access connection is a pre-programmed circuit set up, as required, between two subscribers, in which the subscriber action is to be limited to going "off-hook" to establish the connection within a short time, or "on-hook" to release the connection. A switched hotline is a direct-access connection set up at the highest precedence level.

5. Dialing facilities other than "off-hook" signalling at the calling terminal are not required. The terminals (possibly together with their parent switches) can handle all other in-band signals. The originating network shall initiate circuit set up as for dialed connections.

Multi-timeslot

6. Multi-timeslot operation allows 32, 48, or 64 kbit/s to be sent over a single connection. To ensure end-to-end bit sequence integrity over multi-timeslot connections, the sequence of bits (in each frame) is assigned to timeslots in ascending order, with the first bit placed in the lowest-numbered timeslot. The timeslots assigned are not necessarily consecutive. For multi-timeslot connections setup on a circuit-switched basis, the Connection Request Message shall include the optional channel map as specified in Appendix 1, Annex D, to STANAG 4208. Multi-timeslot connections may be dialed, permanent connections, or sole-user connections. For permanent connections, other than between packet switches, there shall be bilateral agreement on the application, the number of timeslots, and their timeslot numbers.

Permanent connection

7. A permanent connection is a link between two gateway switches. Permanent connections are provided by the pre-assignment of timeslots on the link between the two gateway switches. The preassigned timeslots are normally set up at link initialization and thus require preliminary agreement between system managers. Permanent connections are available to the connected network elements at any time during the period of activity of the gateway link, in accordance with system managers.

Sole-user connection

8. A sole-user connection is a circuit connecting two subscribers on a full time basis for a certain period of time.

9. A sole-user connection is set up on request from one network user, by the system manager of that network, in accordance with paragraphs 2, 3, and 4 of Annex D to STANAG 4208.

The network does not impose any requirements for signalling capabilities at the terminals (end systems). If a sole-user circuit is not to be preempted, the connection must be assigned with the highest precedence level. If a sole-user circuit is
interrupted, restoration shall be accomplished in accordance with paragraph 5(d) of Annex D to STANAG 4208. Final release of
sole-user circuits shall be accomplished in accordance with paragraph 5(e) of Annex D to STANAG 4208.

Timeslot

10. A timeslot is the basic element of a time-division multiplexed frame and contains a fixed number of n bits, e.g., n = 1 bit for CVSD. A given number of timeslots are forming the time-division multiplexed frame with a frame length of t seconds. The use of a given timeslot with n bits in consecutive frames leads to a digital channel with a bit rate of

$$n/t \text{ (bit/s)} \qquad \text{(a)}$$

For a multiplex group bit rate of 256 kbit/s and 16 timeslots per frame, the frame length is

$$t = 16/(256 \times 10^3) = 0.0625 \times 10^{-3} \text{ (s)}$$

With n = 1 bit per timeslot and a frame length of t = 0.0625 ms, the channel bit rate is in accordance with (a):

$$= 1 \times 10^3/0.0625 = 16 \text{ kbit/s}$$

The use of m timeslots in each consecutive frame leads to a multi-timeslot channel with a bit rate of

$$m \times n/t \text{ (bit/s)} \qquad \text{(b)}$$

ANNEX C to
STANAG 4206
(3rd Edition)

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NATO PROTOCOL IMPLEMENTATION CONFORMANCE STATEMENT (NPICS) PROFORMA

1. Introduction

1.1 For a protocol implementation which is claimed to conform to STANAG 4206, the following NPICS proforma shall be completed.

1.2 For a NATO standard, NPICS corresponds to the Protocol Implementation Conformance Statement defined in ISO/IEC 9646-1 for an International Standard. The term NPICS is used to avoid confusion where the requirements for NPICS and PICS differ. Since no PICS proforma for STANAG 4206 exists, a complete NPICS has been developed.

1.3 A completed NPICS proforma is the NPICS for the implementation in question. The NPICS is a statement of which capabilities and options of the protocol have been implemented. The NPICS can have a number of uses:

1.3.1 use by the protocol implementor, as a check list to reduce the risk of failure to conform to the standard through oversight;

1.3.2 use by the nation/supplier and acquirer - or potential acquirer - of the implementation, as a detailed indication of the capabilities of the implementation, stated relative to the common basis for understanding provided by the standard NPICS proforma;

1.3.3 use by the user - or potential user - of the implementation, as a basis for initially checking the possibility of interworking with another implementation (note that, while interworking can never be guaranteed, failure to interwork can often be predicted from incompatible NPICSs); and

1.3.4 use by a protocol tester, as the basis for selecting appropriate tests against which to assess the claim for conformance of the implementation.

NOTE D1: All material in the base standard, i.e. STANAG 4206, is considered mandatory unless another status is specifically indicated in this NPICS proforma.

2. Abbreviations and special symbols

2.1 Status symbols

M	mandatory
O	optional
O.<n>	optional, but support of at least one, or exactly one, of the group of options labeled by the same integer <n> is required
X	prohibited
<pred>:	conditional-item symbol, including predicate identification; see 3.4
^	logical negation, applied to a conditional item's predicate

2.2 General abbreviations

[]	enclose an optional entry
<>	denotes a generic identifier
<n>	a number
<x>	a lowercase letter

2.3 Item references

Items in the NPICS proforma are identified by mnemonic item references. NPICS items dealing with related functions are identified by item references sharing the same initial letter or letter-pair (in capitals). Below is a list of those initials, in the order in which the groups of items occur in the NPICS proforma:

IE	Interconnection point (in the air)
IC	Interconnection point on cable
IO	Interconnection point on optical cable
V	voice mode
NV	non-voice mode
MF	multiplex group framing
BR	bit rate
BRC	bit rate conversion
NC	non-voice characteristics
D	directory
PL	precedence levels
P	performance
C	conferences
CL	cable links
RR	radio relay
T	timing
J	jitter
SL	satellite link
CS	communications security

EOW	engineering orderwire
CON	control

2.4 Base standard references

The generic format of a reference of the NPICS proforma is:

<paragraph>

for a reference to the main STANAG part, and

[<part>]<Annex>[<Appendix>]/<Paragraph>

for all other parts of the STANAG, where:

<Part>	= A capital Roman number	(I, II, etc.)
<Annex>	= An uppercase letter	(A, B, etc.)
<Appendix>	= A number or upper case letter	(A, B, etc. or 1, 2, etc.)
<Paragraph>	= <n>.[<n>] or <n>.[<x>], as appropriate	

3. Instructions for completing the NPICS proforma

3.1 General structure of the NPICS proforma

3.1.1. The first part of the NPICS proforma - Implementation Identification and Protocol Summary - is to be completed as indicated with the information necessary to identify fully both the nation/supplier and the implementation.

3.1.2 The main part of the NPICS proforma is a fixed-format questionnaire, divided into a number of major subclauses; these can be divided into further subclauses, each containing a group of individual items. Answers to the questionnaire items are to be provided in the rightmost column, either by simply marking an answer to indicate a restricted choice (such as Yes or No), or by entering a value or a set or range of values. There are some items where two or more choices from a set of possible answers can apply: All relevant choices are to be marked.

3.1.3 Each item is identified by an item reference in the first column; the second column contains the question to be answered; the third column contains the text reference (STANAG or other reference). The remaining columns record the status of the

item - whether support is mandatory, optional, prohibited, or conditional - and provide the space for the answers: See 3.4 below.

3.1.4 A nation/supplier may also provide - or be required to provide - further information, categorized as either Additional Information or Exception Information. When present, each kind of further information is to be provided as a further subclause of items labeled A<i> or X<i>, respectively, for cross-referencing purposes, where <i> is any unambiguous identification for the item (e.g., simply a numeral): There are no other restrictions on its format and presentation.

3.1.5 A completed NPICS proforma, including any Additional and Exception Information, is the NATO Protocol Implementation Conformance Statement for the implementation in question.

> NOTE D2: Where an implementation is capable of being configured in more than one way, a single NPICS may be able to describe all such configurations. However, the nation/supplier has the choice of providing more than one NPICS, each covering some subset of the implementation's configuration capabilities, in case that makes for easier or clearer presentation of the information.

3.2 Additional information

Items of Additional Information allow a nation/supplier to provide additional information intended to assist the interpretation of the NPICS. It is not intended or expected that a large quantity will be supplied, and an NPICS can be considered complete without any such information. Examples might be an outline of the ways in which a (single) implementation can be setup to operate in a variety of environments and configurations; or a brief rationale - based perhaps on specific application needs - for the exclusion of features which, although optional, are nonetheless commonly present in implementations of this protocol.

References to items of Additional Information may be entered next to any answer in the questionnaire, and may be included in items of Exception Information.

3.3 Exception information

3.3.1 It may occasionally happen that a nation/supplier will wish to answer an item with mandatory or prohibited status (after any conditions have been applied) in a way that conflicts with the indicated requirement. No pre-printed answer will be found in the Support column for this: Instead, the nation/supplier

shall write the missing answer into the Support column, together with an X<i> reference to an item of Exception Information, and shall provide the appropriate rationale in the Exception item itself.

3.3.2 An implementation for which an Exception item is required in this way does not conform to STANAG 4206.

NOTE D3: A possible reason for the situation described above is that a defect in the standard has been reported, a correction for which is expected to change the requirement not met by the implementation.

3.4 Conditional status

3.4.1 Conditional items

3.4.1.1 The NPICS proforma contains a number of conditional items. These are items for which the status - mandatory, optional, or prohibited - that applies depends upon whether or not certain other items are supported, or on the values supported for other items.

3.4.1.2 In many cases, whether or not the item applies at all is conditional in this way, as well as the status when the item does apply.

3.4.1.3 Where a group of items is subject to the same condition for applicability, a separate preliminary question about the condition appears at the head of the group, with an instruction to skip to a later point in the questionnaire if the "Not Applicable" answer is selected. Otherwise, individual conditional items are indicated by one or more conditional symbols (on separate lines) in the status column.

3.4.1.4 A conditional symbol is of the form "<pred>:<x>" where "<pred>" is a predicate as described in 3.4.2 below, and "<x>" is one of the status symbols M, O, O.<n>, or X.

3.4.1.5 If the value of the predicate in any line of a conditional item is true (see 3.4.2), the conditional item is applicable, and its status is that indicated by the status symbol following the predicate; the answer column is to be marked in the usual way. If the value of a predicate is false, the Not Applicable (N/A) answer is to be marked in the relevant line. Each line in a multi-line conditional item should be marked.

3.4.2 Predicates

3.4.2.1 A predicate is one of the following:

a. An item-reference for an item in the NPICS proforma: the value of the predicate is true if the item is marked as supported, and is false otherwise.

b. A predicate name, for a predicate defined elsewhere in the NPICS proforma item (see below).

c. The logical negation symbol "^" prefix to an item-reference or predicate name; the value of the predicate is true if the value of the predicate formed by omitting the "^" is false, and vice versa.

3.4.2.2 The definition for a predicate name is a boolean expression constructed by combining simple predicates, as in a or b above, using the boolean operators AND, OR, and NOT, and parentheses, in the usual way. The value of such a predicate is true if the boolean expression evaluates to true when the item-reference is interpreted as in a, above.

3.4.2.3 Each item whose reference is used in a predicate or predicate definition is indicated by an asterisk in the Item column.

4. Implementation identification

NATION/SUPPLIER	
Contact point for queries about the NPICS	
Implementation Name(s) and Version(s)	
Other information necessary for full identification - e.g., name(s) and version(s) of machines and/or operating systems; system names	

NOTES: D4. Only the first three items are required for all implementations; other information may be completed as appropriate in meeting the requirement for full identification.

D5. The terms *Name* and *Version* should be interpreted appropriately to correspond with a national supplier's terminology (e.g., Type, Series, Model).

IDENTIFICATION OF PROTOCOL SPECIFICATION	STANAG 4206
Identification of amendments and corrigenda to this NPICS proforma which have been completed as part of this NPICS.	Am. : Corr. : Am. : Corr. : Am. : Corr. : Am. : Corr. :
Have any Exception items been required (see 3.3)? (The answer Yes means that the implementation does not conform to STANAG 4206	No ☐ Yes☐

DATE OF STATEMENT	

5. General characteristics

ITEM	FEATURES	REFERENCES	STATUS	SUPPORT
	Interconnection points:			
*IE	- radio (E)	6, 7, ST4212	O	Yes [] No []
*IC	- cable (C)	6, ST4210	M	Yes []
*IO	- fiber Optic Cable	7, ST4290	O	Yes [] No []
	Types of traffic			
V	- voice	A/1	M	Yes []
	- non-voice:			
NV1	- telegraph	A/1	O	Yes [] No []
NV2	- facsimile	A/1	O	Yes [] No []
NV3	- computer data	A/1	O	Yes [] No []

* Predicate usage:
IE is used in items P4 and CS1
IC is used in items CS1, and CS2
IO is used in item CL3, and CS2.

6. Traffic characteristics

ITEM	FEATURES	REFERENCES	STATUS	SUPPORT
MF	- multiplex group framing implementation in compliance with ST4207	B/7, ST4207	M	Yes []
	Channel rate:			
BR16	- 16-kbit/s channel transmission rate	A/2	M	Yes []
*BR32	- 32-kbit/s channel transmission rate	B/6	O	Yes []No []
BRC	- Conversion of dissimilar rates	A/2	BR32:M	Yes []NA []
	Characteristics of voice traffic:			
V1	- voice mode calls shall deliver CVSD-encoded signals in compliance with ST4209	A/3, ST4209	M	Yes []
	Characteristics of non-voice traffic:			
NC1	- Non-voice traffic at a maximum information rate of 16-kbit/s	A/4	M	Yes []
NC2	- circuit-switched connections in compliance with ST4213	A/5, ST4213	M	Yes []
NC3	- packet-switched connections in compliance with ST4249	A/5, ST4249	O	Yes []No []
NC4	- circuit-switched transparency during traffic phase	A/6	M	Yes []
	Directory organization:			
D1	- 7-digit subscriber address	A/8	M	Yes []
D2	- fixed and deducible addressing according to STANAG 5046	A/8, ST5046	O	Yes []No []
D3	- 6-digit prefix in compliance with ST4214	A/9, ST4214	M	Yes []
	Precedence levels:			
PLn	- handle precedence in compliance with ST4208	A/11, ST4208	M	Yes []
PLt	- for transit calls, precedence levels are forwarded	A/11	M	Yes []

* Predicate usage:
BR32 is used in item BRC.

7. Transmission performance

ITEM	FEATURES	REFERENCES	STATUS	SUPPORT
P1	End-to-End on a call: - error rate not exceeding 1 in 100 for 95% of any 1-minute period	A/12	O	Yes [] No []
P2	Error rate between GFs: - not exceed 4 in 10E4 for 99% of any 1-minute period	B/12	M	Yes []
P3	Cable Interface: - bit error rate not exceeding 1 in 10E6 for 99% of any 1-minute period	B/13.d	M	Yes []
P4	Radio Relay Interface: - bit error rate not exceed 1 in 10E4 for 99% of any 1 minute period	B/15.c	IE: M	Yes [] N/A []

8. International conferences

ITEM	FEATURES	REFERENCES	STATUS	SUPPORT
C1	- as a minimum, connection of a single subscriber without any control mechanism	A/16 A/20	M	Yes []
*C2	- enable port only when subscriber indicated he wishes to talk	A/17	O	Yes [] No []
C3	- port controlled by the pressel on and off CPC transmitted at 16 kbit/s	A/19	C2: O.1	Yes [] No [] NA []
C4	- port enabled by other method which doesn't require pressel signals	A/20	C2: O.1	Yes [] No [] NA []
C5	- conference calls follow the same precedence rules as normal calls	A/21	M	Yes []
C6	- originating network shall provide conference bridge function.	A/22, ST4208	M	Yes []
C7	- ability to provide pressel CPC for control of a conference bridge in a connected network	A/17	O	Yes [] No []

* Predicate usage:
C2 is used in items C3 and C4.

9. Cable links between gateway facilities

ITEM	FEATURES	REFERENCES	STATUS	SUPPORT
CL1	- spiral-4 cable in compliance with ST4210	6, 7, B/13.a,	M	Yes []
CL2	- 16-kbit/s EOW on phantom in compliance with ST4210	B/13.c, ST4210	M	Yes []
CL3	- fiber optic cable in compliance with ST4290	7, B/14	IO: M	Yes [] N/A []
CL4	- 16-kbit/s EOW in compliance with ST4290	7, B/14	IO: M	Yes [] N/A []

10. Radio relay section between gateway facilities

If the interconnection point, IE, cannot be between radio-relay sites, mark N/A and skip this subclause. N/A []

ITEM	FEATURES	REFERENCES	STATUS	SUPPORT
RR1	- binary FM in compliance with ST4212	B/15.a, B/16	M	Yes []
RR2	- 16-kbit/s EOW in compliance with ST4212	B/15.b, B/16	M	Yes []

11. Timing and jitter

ITEM	FEATURES	REFERENCES	STATUS	SUPPORT
T1	- high stability clock at the sending end. Accuracy better than 1 in 10E9	B/8	M	Yes []
T2	- 24-hour bit count integrity (BCI)	B/9	M	Yes []
T3	- capable resetting buffer at any time	B/9	M	Yes []
T4	- resynchronize after buffer store reset	B/9	M	Yes []
T5	- BCI during fading periods of up to 20 ms	B/10	M	Yes []
J1	- jitter not exceeding values in Figures 2 & 3	B/11	M	Yes []
J2	- tolerate at least the jitter values of Figures 2 & 3	B/11	M	Yes []

12. COMSEC

ITEM	FEATURES	REFERENCES	STATUS	SUPPORT
CS1	- approved NATO encryption device	B/19	IE: M IC: O.2 IO: O.3	Yes [] Yes [] No [] Yes [] No []
CS2	- approved circuit techniques	B/19	IC: O.2 IO: O.3	Yes [] No [] Yes [] No []

13. Engineering orderwire

ITEM	FEATURES	REFERENCES	STATUS	SUPPORT
EOW 1	- EOW access at intermediate manned sites	B/20	O	Yes [] No []
EOW 2	- EOW implementation in compliance with ST4209 and ST4211	B/21, ST4209 ST4211	M	Yes []

14. Gateway control

ITEM	FEATURES	REFERENCES	STATUS	SUPPORT
CON	- Provision for exchange of control information and user data in accordance with ST4211	B/22, ST4211	M	Yes []

15. Packet-channel setup procedures

If packet-switched data is not supported, i.e., item NV3, mark N/A and skip subclause. N/A[].

ITEM	FEATURES	REFERENCES	STATUS	SUPPORT
	Single timeslot operation:			
PS1	- permanent connection using timeslot 2	B/23.a	M	Yes []
PS2	- permanent connection using mutually agreed timeslot	B/23.e	O	Yes [] No []
PS3	- sole-user circuit-switched connection	B/23.f, ST4208	O	Yes [] No []
	Multi-timeslot operation:			
*PS4	- permanent connections	B/23.b	O	Yes [] No []
*PS5	- sole-user circuit-switched connections	B/23.f	O	Yes [] No []
	Permanent connection using timeslots:			
PS6	- 2,3 for 32 kbit/s	B/23.b	PS4: O.4	Yes[]No[]NA[]
PS7	- 2,3,4 for 48 kbit/s	B/23.b	PS4: O.4	Yes[]No[]NA[]
PS8	- 2,3,4,5, for 64 kbit/s	B/23.b	PS4: O.4	Yes[]No[]NA[]
PS9	- permanent connection using mutually agreed timeslots	B/23.e	PS4: O.4	Yes[]No[]NA[]
PS10	- circuit-switched connection using timeslots assigned in connection-request message	B/23.f, ST4208	PS5: M	Yes [] NA []
	Data Class:			
PS11	- Class 4 @ 9.6 kbit/s	B/23.c	M	Yes []
PS12	- Class 4 @ 2.4 kbit/s	B/23.c	O	Yes [] No []
PS13	- Class 1	B/23.c	O	Yes [] No []

* Predicate usage:
PS4 is used in items PS6, PS7, PS8 and PS9.
PS5 is used in item PS10.